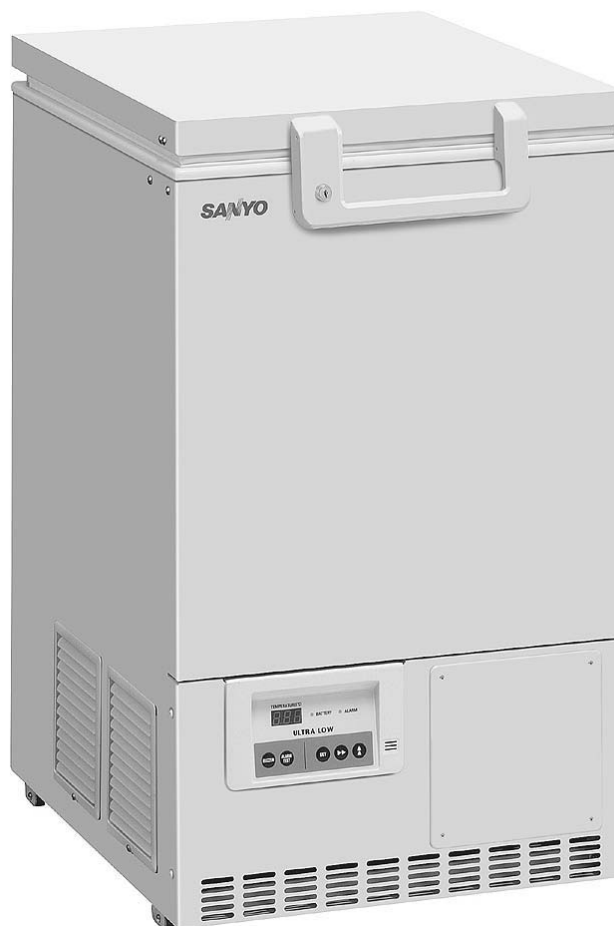


Service Manual

Ultra-Low Temperature Freezer MDF-C8V1

FILE No.

SANYO Electric Co., Ltd.
Biomedical Business Division



! **RoHS**

This product does not contain any hazardous substances prohibited by the RoHS Directive.
(You will find 'RSF' mark near the rating plate on the RoHS compliant product.)

! **WARNING**

- * You are requested to use RoHS compliant parts for maintenance or repair.
- * You are requested to use lead-free solder.

Effective models

This service manual is effective following models.

Model name	Product code	Voltage and Frequency	
MDF-C8V1	823 012 51	115V	60Hz
	823 012 52	220V	50Hz
	823 012 53	220V	60Hz
	823 012 54	220/230/240V	50Hz
	823 012 55	220V	50Hz
	823 012 56	110V	60Hz

Contents

	Page
Specifications -----	1
- Structural specifications	
- Control specifications	
- Performance specifications	
Dimensions -----	4
Cooling unit parts -----	5
Cooling circuit -----	6
Components on PCB -----	7
Electric parts -----	8
Specifications of sensor -----	9
Wiring diagram -----	10
Circuit diagram -----	11
Connections on PCB -----	12
Control specifications -----	13
Parts layout -----	22
Test data -----	25
- Pull-up & Pull-down temperature	
- Pull-down temperature	
- Pull-down pressure	
- Pull-down current input	
- Temperature uniformity (15points measured)	
Instruction manual -----	34

Upon unit repair:

- Be sure to collect refrigerant thoroughly and pull vacuum for 5 minutes at least, before you repair the unit. It may be caused fire in welding process by using 'R-600'.
- You should use 'MU-N49' for servicing.

Procedures for trial operation:

1. Turn all the switches (Power SW and Battery SW) off beforehand.
2. Connect the plug to outlet then turn Power SW on.
3. Turn Battery SW on.

(Note) If you turn battery switch on prior to turn power switch on, buzzer should be emitted until the unit is reached to setting temperature.

Specifications

■Structural specifications

Item	Specifications
External dimensions	W 550 × D 685 (+83)* × H 945 (mm)
Internal dimensions	W 405 × D 490 × H 425 (mm)
Effective capacity	84 L
Exterior	Painted steel
Interior	Painted steel
Door	Painted steel
Insulation	Cabinet; Rigid polyurethane foamed-in place and VIP(vacuum insulation panel) Door; Rigid polyurethane foamed-in place
Door lock	1pc (also used as a latch)
Caster	4pc, (2 leveling foot)
Access port	φ 17mm, back side, bottom
Refrigeration circuit	Primary cooling system
Compressor	Hermetic rotary type, 400W
Evaporator	Tube on sheet type (also used as a inner cabinet)
Condenser	Finless tube type
Refrigerant	HFC mixed refrigerant (R245fa/R600/R23/R14)
Refrigerant oil	Ze-NIUSL22SA
Power supply	Local voltage
Weight	67 kg
Accessory	1 set of key, 1 scraper
Optional component	Automatic temperature recorder (MTR-85H, MTR-G85) Mounting kit for MTR-85H (MDF-S3085) Recorder sensor cover (MTR-C8) Back-up system (CVK-UB4) Back-up mounting plate (MDF-UBK) Inventory rack (IR-207C, IR-305C)

* means the dimension of projected area.

■Control specifications

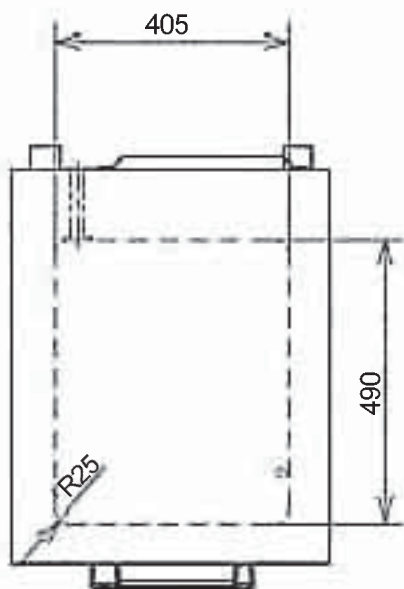
Item		Specifications
Cooling performance		-80°C (1/2H temp, AT 30°C, no load)
Temperature control range		-60°C~-80°C(AT5~30°C, no load)
Temperature controller		Microprocessor controlled system: Key-pad input Temperature set range: -55°C~-85°C (1°C increment) Set value kept in non-volatile memory
Temperature sensor		Pt.1000 Ω
Temperature display		LED digital display (1°C increment)
Alarms	High temp.	Selectable +5°C~+20°C for high temp. alarm (Initial; +10°C) ALARM lamp blinks and intermittent buzzer sounds with 15min.of delay Remote alarm contact: Normal Open, rating 30VDC, 2A Temperature alarm turns on during power failure (not linked with buzzer)
	Low temp.	Selectable -5°C~-20°C for low temp. alarm (Initial; -10°C) ALARM lamp blinks and intermittent buzzer sounds with 15min.of delay Remote alarm contact: Normal Open, rating 30VDC, 2A Temperature alarm turns on during power failure (not linked with buzzer)
	Power failure	ALARM lamp blinks with intermittent buzzer sounds, remote alarm outputs.
	Remote alarm	3P remote alarm terminal: Maximum 30VDC, 2A NC-COM、NO-COM Outputs during temperature alarm and power failure alarm.
	Battery check	BATTERY lamp is lit when accumulation time is about 3 yrs
	Fan motor check	BATTERY lamp blinks when accumulation time is about 6 yrs
Control panel		Lamp: ALARM, BATTERY BUZZER: Buzzer key ALARM TEST: Alarm test key SET: To switch SV and PV >: To shift the digit Λ: To change the digit
Key lock function		With > key is pressed for 5 seconds; L0: Unlocked L1: Locked
Self diagnosis function		Temp. control sensor abnormality ● Error code and chamber temp. are alternately displayed. ● Remote alarm contact is ON and the buzzer sounds.
		Fan motor malfunction ● Error code and chamber temp. are alternately displayed. ● ALARM lamp blinks and buzzer sounds.
Power switch		Breaker switch
Compressor protection		Internal thermostat and comp. sensor

■Performance specifications

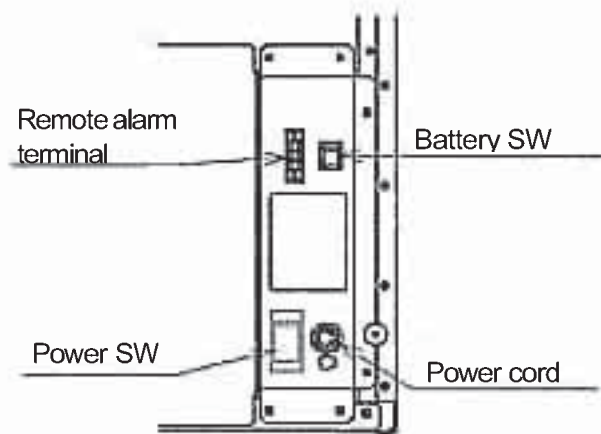
Cooling performance	-80°C(ambient temperature; 30°C, no load)					
Temp. control range	-60°C to -80°C(ambient temperature; 30°C, no load)					
Rated voltage	AC110V	AC115V	AC220V	AC230V	AC240V	AC220V
Rated frequency	60Hz	60Hz	50Hz	50Hz	50Hz	60Hz
Rated power consumption	330W	340W	310W	330W	365W	350W
Noise level	47 dB [A] (background noise; 20dB)					
Maximum pressure	3.5MPa					

Note) Specifications will be subject to change without notice.

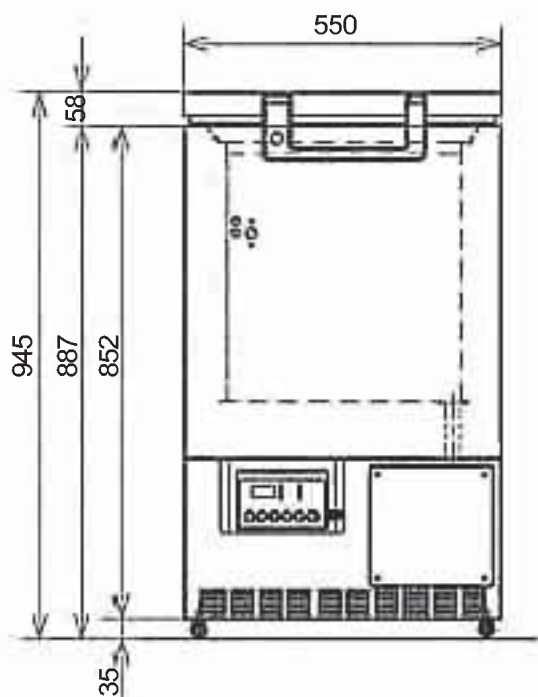
Dimensions



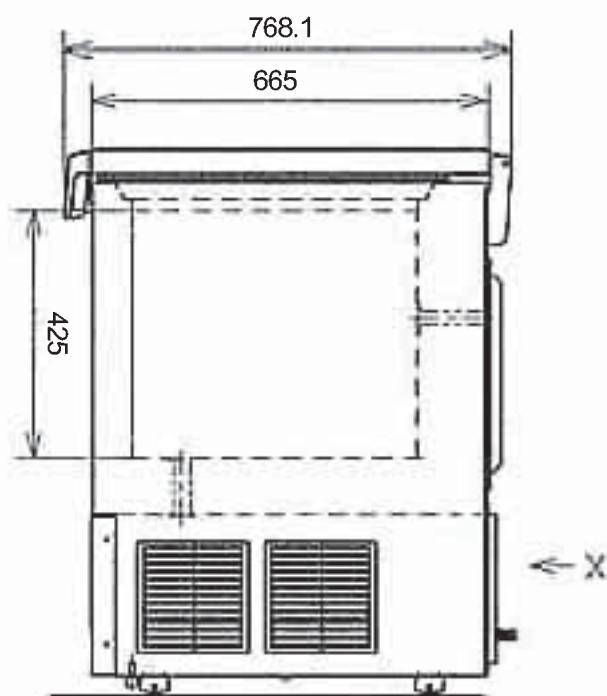
Top



Back-right side



Front



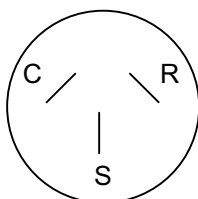
Side

Cooling unit parts

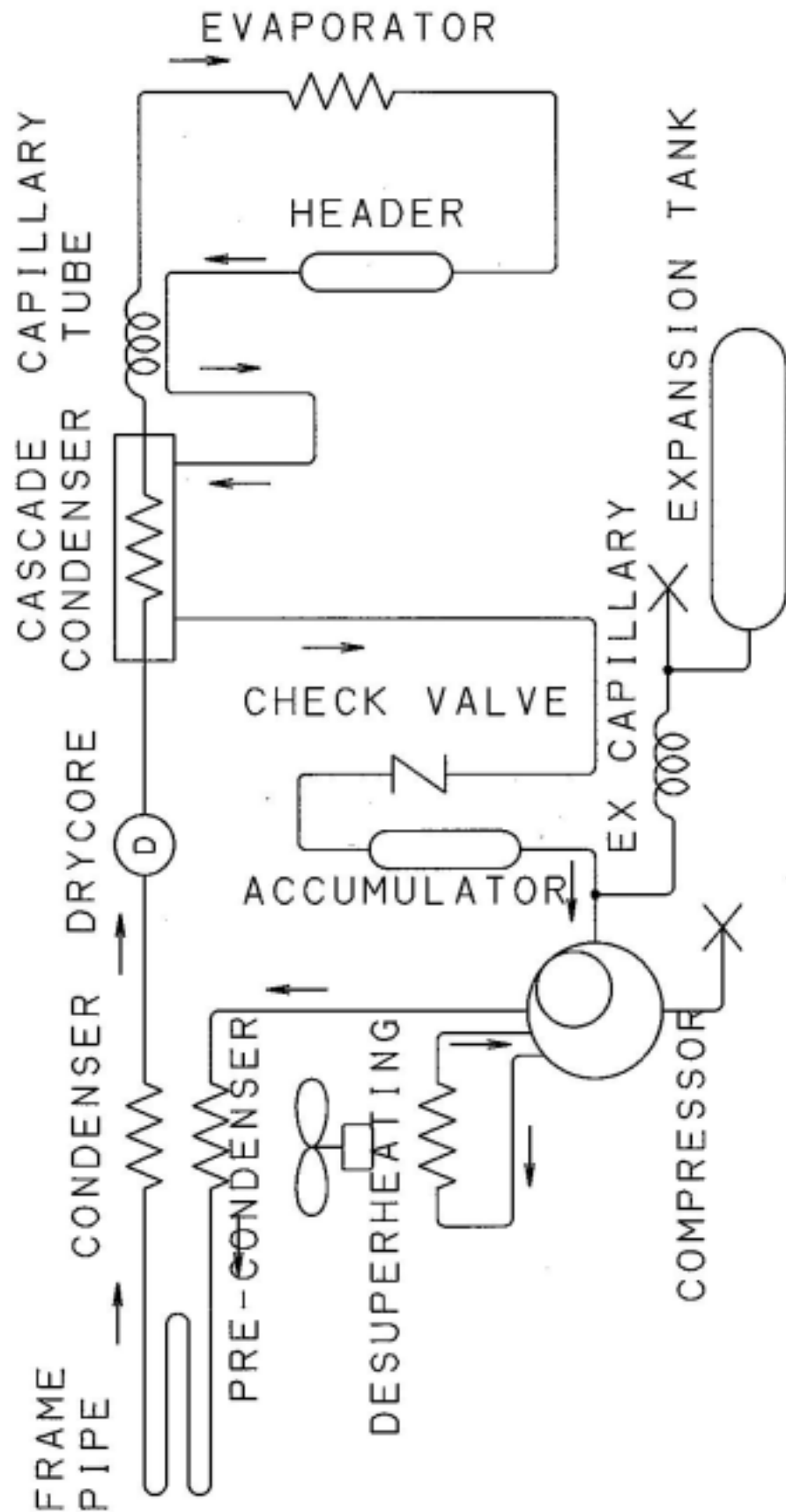
<MDF-C8V>

Item	Specifications	
Compressor		
115V, 60Hz	Type: C-2SN400L2W	Compressor code: 807 780 22
220/230/240V, 50Hz	Type: C-2SN400L5W	Compressor code: 807 780 25
Refrigerant oil	Ze-NIUSL22SA	Charged q'ty: 280cc
Cooling system	Forced air cooling	
Condenser		
Type	Finless tube	Cascade condenser
Condenser	8 columns x 2 lines	Coil pipe W200 mm x 8 columns
Pre-condenser	7 columns x 1 line P290 mm	—
Frame pipe	φ 4.76 x T0.7 mm	—
Evaporator	φ 7.94 x T0.7 mm	
Type	Tube on sheet (also used as interior)	
Capillary tube	φ 1.2	
Resistance (PSI kg/cm ²)	0.59 MpaG	
Length (mm)	2000	
Outer diameter (mm)	φ 1.8	
Refrigerant	HFC mixed refrigerant: MU-N48(EU)/(DOT) Charged q'ty: 375+/-8 g	
Dryer	Dry core: D-SM032T Charged q'ty: 35g	
Condensing fan	φ 196 mm, 4 blades Material: ABS	
Condensing fan motor	(115V, 60Hz) SE4-D041N1P Output: 4W	
	(220/230/240V, 50Hz) SE4-D041N5P Output: 4W	

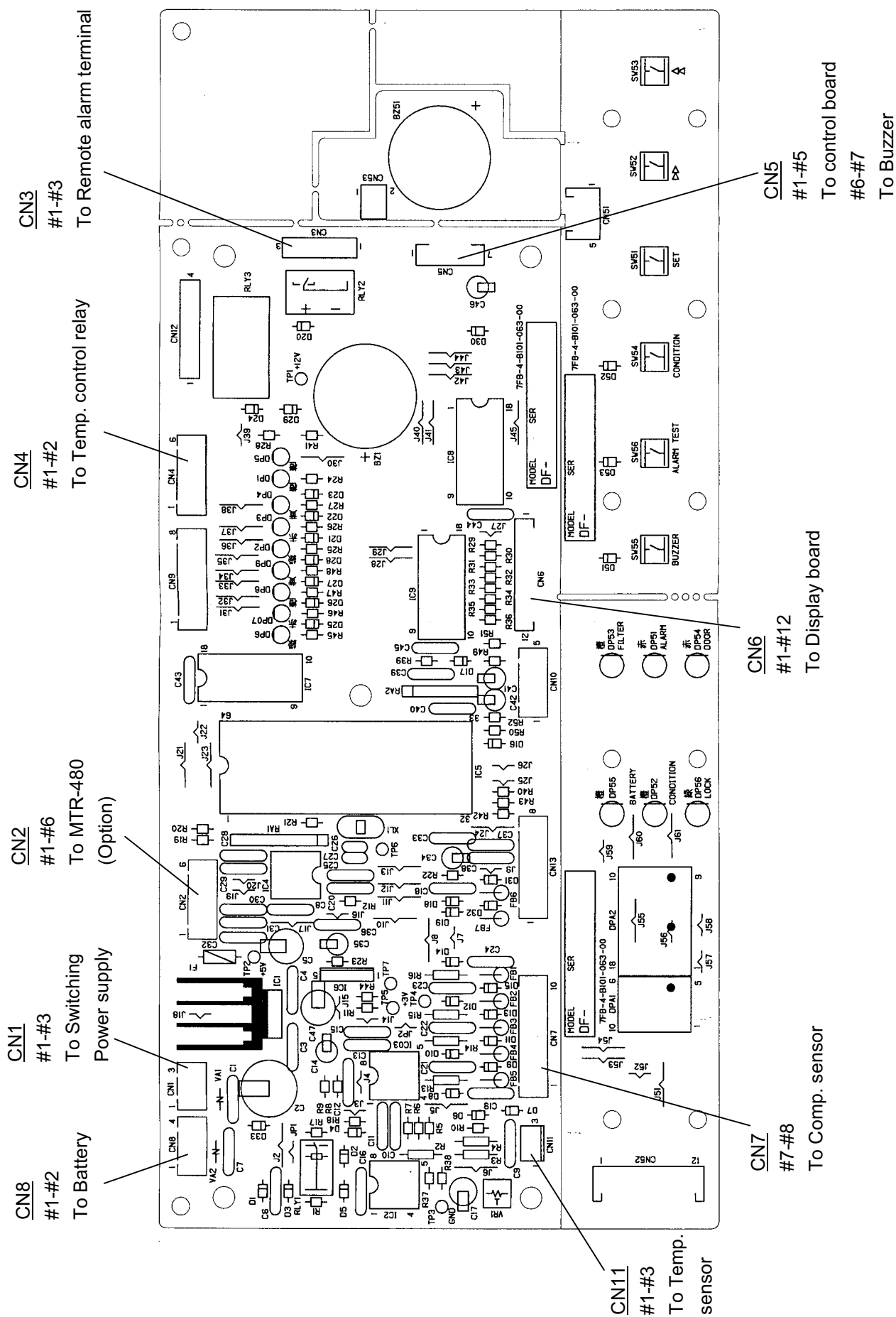
<Compressor terminals layout>



REFRIGIATION CIRCUIT PRINCIPLE DIAGRAM (MDF-C8V)



Components on PCB



Electric Parts

MDF-C8V1		AC115V, 60Hz	AC220V, 60Hz	AC220/230/240V, 50Hz
Compressor	Type	C-2SN400L2W	C-1RN40L6A	C-1RN4L5C
	Compressor code	802 012 11	802 012 16	802 012 15
	Rated voltage (50/60Hz)	φ 1, 110~115V, 60Hz	φ 1, 200V, 60Hz	φ1, 220~240V, 50Hz
	Winding resistance C-R(Main)	1.674 Ω (25°C)	5.34 Ω (25°C)	7.37 Ω (25°C)
	C-S(Aux)	3.419 Ω (25°C)	8.88 Ω (25°C)	15.76 Ω (25°C)
Starting relay	Type	AMVL-165A	AMVL-300A	AMVL-300A
	Pick up voltage	95~115VAC	215~247VAC	215~247VAC
	Drop out voltage	25~60VAC	69~132VAC	69~132VAC
Starting capacitor	Rating	100μF, 160VAC	40μF, 300VAC	40μF, 300VAC
Running capacitor	Rating	35μF, 220VAC	10μF, 400VAC	12μF, 370VAC
Condensing fan motor	Type	SE4-D041N1P	SE4-D041N5P	SE4-D041N5P
	Rating	115V, 4P	220~240V, 4P	220~240V, 4P
Temp. control relay	Type	G4F-11123T	G4F-11123T	G4F-11123T
	Contact capacity	20A, 12VDC	20A, 12VDC	20A, 12VDC
Switching power supply	Type	ZWS10-12/J	ZWS10-12/J	ZWS10-12/J
	Rated output	12VDC, 0.85A	12VDC, 0.85A	12VDC, 0.85A
Breaker switch	Type	BAM215131	BAM215131	BAM215131
	Rating	250V, 15A	250V, 15A	250V, 15A
Temperature sensor	Type	PT1000	PT1000	PT1000
	Rating	1000 Ω (0°C)	1000 Ω (0°C)	1000 Ω (0°C)
Compressor sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5k Ω, 25°C	5k Ω, 25°C	5k Ω, 25°C
Battery switch	Type	SLE6A2-5	SLE6A2-5	SLE6A2-5
	Rating	4A, 250VAC	4A, 250VAC	4A, 250VAC
Battery	Type	5HR-AAC	5HR-AAC	5HR-AAC
	Rating	6V, 1100mAH	6V, 1100mAH	6V, 1100mAH

Specifications of sensor

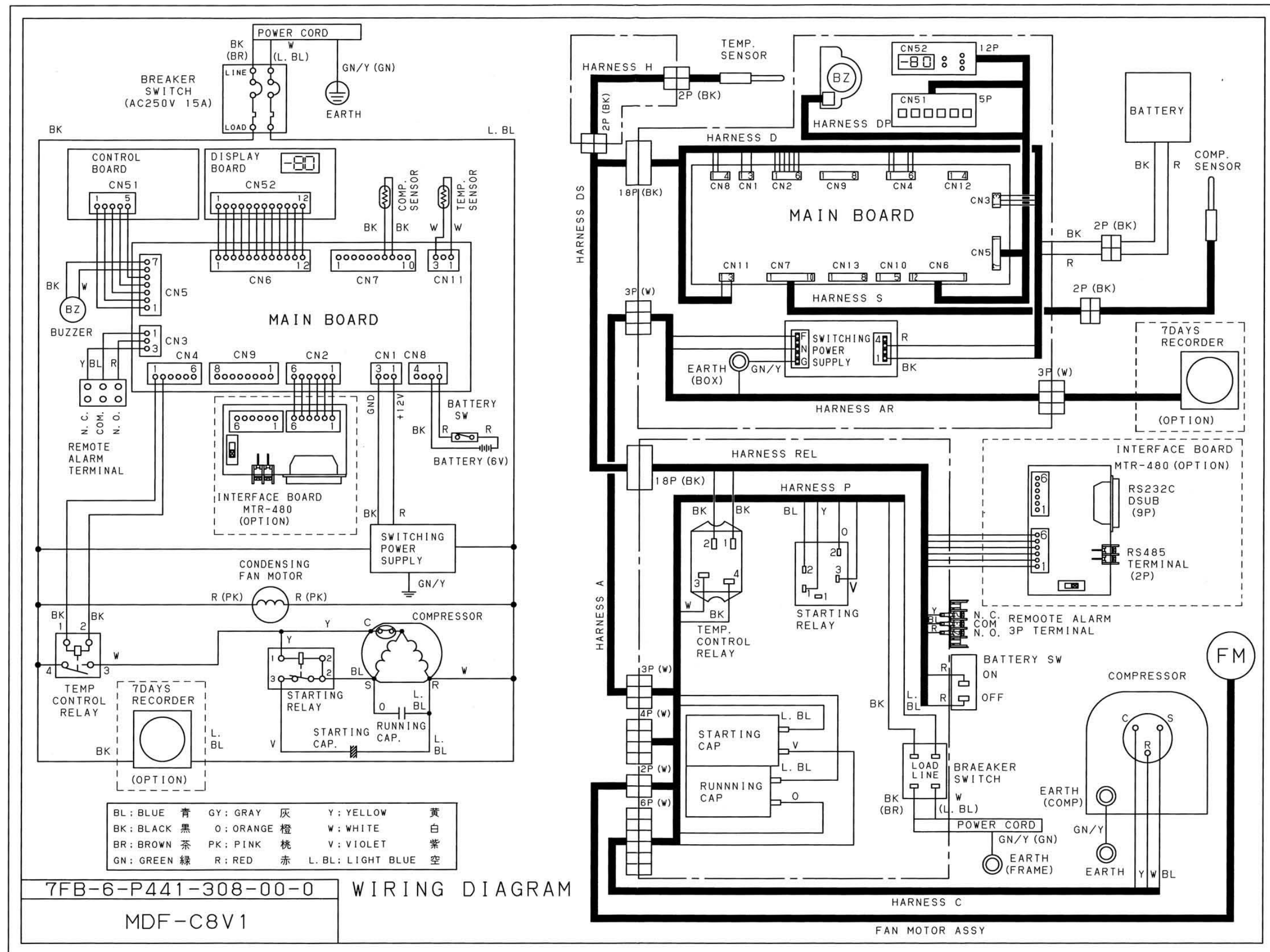
<502AT-1>

Temp. (C)	Resistance Value (k Ω)	Temp. (C)	Resistance Value (k Ω)	Temp. (C)	Resistance Value (k Ω)	Temp. (C)	Resistance Value (k Ω)
-50	154.5	-36	71.80	-22	35.65	0	13.29
-49	145.9	-35	68.15	-21	33.99	5	10.80
-48	137.8	-34	64.71	-20	32.43	10	8.84
-47	130.2	-33	61.48	-19	30.92	15	7.20
-46	123.1	-32	58.43	-18	29.50	20	6.01
-45	116.5	-31	55.55	-17	28.14	25	5.00
-44	110.2	-30	52.84	-16	26.87	30	4.17
-43	104.4	-29	50.23	-15	25.65	35	3.50
-42	98.87	-28	47.77	-14	24.51	40	2.96
-41	93.70	-27	45.45	-13	23.42	45	2.51
-40	88.85	-26	43.26	-12	22.39	50	2.13
-39	84.18	-25	41.19	-11	21.41	55	1.82
-38	79.80	-24	39.24	-10	20.48	60	1.56
-37	75.67	-23	37.39	-5	16.43	65	1.35

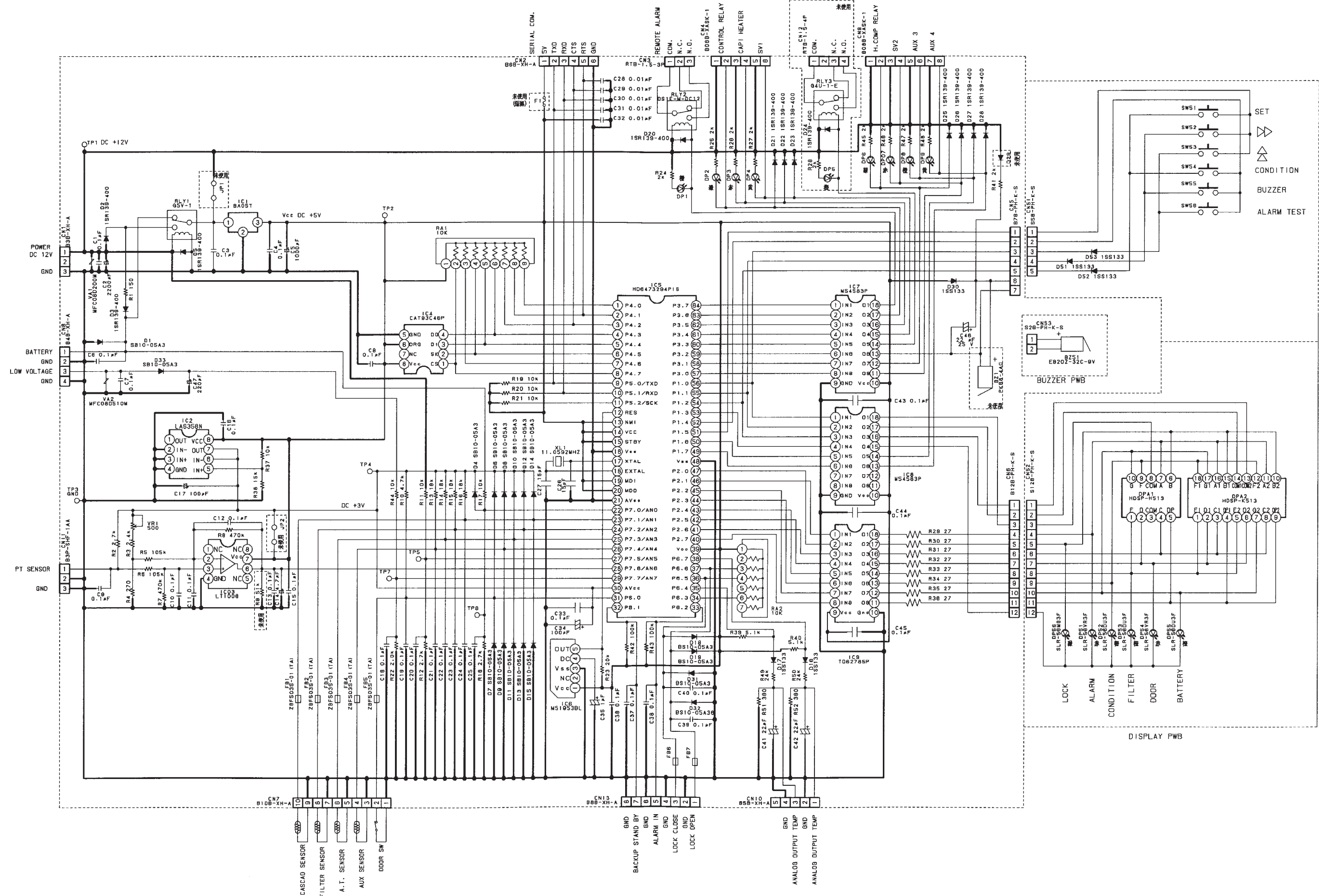
<PT-1000 Ω >

Temperature (°C)	Resistance (Ω)	Temperature (°C)	Resistance (Ω)
-170	326.92	-30	885.13
-160	368.57	-20	923.55
-150	409.87	-10	961.84
-140	450.83	0	1000.0
-130	491.47	10	1038.0
-120	531.83	20	1076.0
-110	571.92	30	1113.8
-100	611.76	40	1151.4
-90	651.38	50	1189.0
-80	690.78	60	1226.4
-70	729.99	70	1263.8
-60	769.02	80	1301.0
-50	807.87	90	1338.0
-40	846.58	100	1375.0

Wiring Diagram



Circuit Diagram



Connections on PCB

Following is the explanation of connections on Main PCB.

Connector	Connects to	Usage	Voltage
CN1	Switching power supply	To supply the power to PCB	#1:12V
CN2	MTR-480 (Option)	To connect with interface	
CN3	Remote alarm terminal #1: COM. #2: N.O. #3: N.C.	Output for remote alarm contact	
CN4	#1-#2: Temp. control relay	To control chamber temperature	
CN5	#1-#5: Control PCB (CN51) #6-#7: Buzzer	To control with each switches	
CN6	#1-#12: Display PCB (CN52)	To connect with each LED	
CN7	#7-#8: Comp. sensor	To detect compressor temperature	
CN8	#1-#2: Battery	To supply the power to Main PCB during power failure	#2:6V
CN9	Unused		
CN11	#1-#3: Temp. sensor	To detect chamber temperature	

Control specifications

1. Key and Switch

- BUZZER** : In alarm condition, buzzer stops sounding with this key pressed.
Remote alarm output and alarm message would not be off.
During the power failure (battery back-up), press the key to show chamber temperature.
- ALARM TEST** : With this key pressed to activate alarm test mode to be forcibly step into alarm condition (ALARM lamp blinks, intermittent buzzer sounds, digital LED goes off and remote alarm inputs).
After approx. 90seconds then, normal condition retrieves with Auto Return activates.
With the battery switch turns off, "E09" blinks on the display.
- SET** : Press this key once to activate set mode (2nd digit in LED blinks), press the key again to store the value to be changed.
With Key Lock setting mode ("L 0" or "L 1" is displayed), press the key to store the value to be changed.
-  : During setting mode, the blinking digit shifts among the 1st digit or the 2nd digit or 3rd digit.
In chamber temperature display, press this key over 5 seconds to be Key Lock mode available with 'L_0' displayed.
-  : During setting mode, count the blinking digit up. In chamber temperature display, press the key over 5 seconds to be function mode available with 'F00' displayed.
Set your desire value with this key and  key, you can use function mode.

2. Temperature control

- Setting range** : -55°C~-85°C
- Display range** : -180°C~+50°C
- Setting procedure** : Press SET key and set the required value with  key and  key.
Press SET key to store the set value.
- Unacceptable setting:** If you try to set value which is out of temperature setting range, the buzzer sounds for 1 second to inform the value is unacceptable.

3. Key Lock mode and Function mode

A) Key Lock mode

Setting range : 0, 1

Setting procedure: In chamber temperature display, press  key over 5 seconds to enter into Key Lock mode. ("L_0" or "L_1" is displayed. initial: L_0) with "0" or "1" blinks.

Change the value with  key and press SET key to store the value in the non-volatile memory.

B) Function mode

Setting range : 00~50

Display range : 00~59

00, 04, 08, 13, 15, 16, 18~20, 26~29, 31, 33~49 are unavailable codes.

Setting procedure : In chamber temperature display, press  key over 5 seconds to enter into function mode with F00 is displayed. Change the blinking 1st digit to desired function code with  key and  key.

Press SET key to be function code available.

Unacceptable
setting:

If you try to input F51~F59 and press SET key, the buzzer sounds to inform the value is unacceptable.

4. Error codes

E01: Temp. sensor is disconnected
E02: Temp. sensor is short-circuited
E05: Comp. sensor is disconnected
E06: Comp. sensor is short-circuited
E09: Battery switch is OFF
E10: Compressor temperature abnormality
E15: Fan motor malfunction

(1) Temp. sensor abnormality

Disconnection: E01 and 50°C are displayed alternately, the buzzer sounds intermittently and remote alarm contact outputs.

The compressor is continuous running.

Press BUZZER key to stop the buzzer sounding.

Short circuit: E02 and -170°C~-180°C are displayed alternately, the buzzer sounds intermittently and remote alarm contact outputs.

The compressor is continuous running.

Press BUZZER key to stop the buzzer sounding.

(2) Comp. sensor abnormality

Disconnection: E05 and chamber temperature are displayed alternately, the buzzer sounds intermittently and remote alarm contact outputs.

Press BUZZER key to stop the buzzer sounding.

Short circuit: E06 and chamber temperature are displayed alternately, the buzzer sounds intermittently and remote alarm contact outputs.

Press BUZZER key to stop the buzzer sounding.

(3) Battery switch is OFF Press ALARM TEST key to display E09.

(4) Comp. temperature abnormality E10 and chamber temperature are displayed alternately and compressor stops running.

Press BUZZER key to stop the buzzer sounding.

(5) Fan motor malfunction E15 and chamber temperature are displayed alternately.
Press BUZZER key to stop the buzzer sounding.

(6) Error code priority

No.1: Temp. sensor abnormality (E01 or E02)

No.2: Comp. sensor abnormality (E05 or E06)

No.3: Comp. temperature abnormality (E10)

No.4: Fan motor malfunction (E15)

5. Warning functions

High temp. alarm : When chamber temperature is equal or higher than setting temperature + high temp. alarm setting temperature + 1, ALARM lamp and digits are blinking, intermittent buzzer sounds with about 15 minutes of delay, and remote alarm output turns on.

When chamber temperature is equal or lower than setting temperature ALARM lamp and digits go off, buzzer stops sounding and remote alarm output turns off.

If you press BUZZER key, the buzzer stops sounding instead remote alarm output does not turn off.

- Low temp. alarm : When chamber temperature is equal or lower than setting temperature + low temp. alarm setting temperature - 1, ALARM lamp and digits are blinking, intermittent buzzer sounds with about 15 minutes of delay, and remote alarm output turns on.
When chamber temperature is equal or higher than setting temperature, ALARM lamp and digits go off, buzzer stops sounding, and remote alarm output turns off.
If you press BUZZER key, the buzzer stops sounding instead remote alarm output does not turn off.
- Power failure alarm : When the power switch is OFF with battery switch is ON or the power to the unit is disconnected or in case of power failure, ALARM lamp is blinking, intermittent buzzer sounds and remote alarm output turns on.
If the power retrieves within 3 seconds, the unit starts to run with initial settings. Remote alarm output turns off.
In case of power failure alarm, press BUZZER key to show chamber temperature for 5 seconds.

6. Self diagnosis and safety functions

- Auto Return : If there is not any key operation for 90 seconds in each setting mode, Key Lock mode and Function mode, the display automatically reverts to chamber temperature.
- Ring back : Buzzer forcibly sounds again after setting time elapses even if anyone press BUZZER key to stop buzzer sounding in alarming condition.
Ring back time is settable in F25.
- Sensor temp. display F12: Temperature in temp. sensor is displayed
(Ex. -80.2°C → displayed as '80.2')
F14: Temperature of comp. sensor is displayed.
(Ex. +23°C → displayed as '023')
- Battery lifespan check: F03: Notice of battery accumulation time
(Ex. 2years and 6months accumulated → Displayed as '02.5')
BATTERY lamp is lit if '02.8' is displayed.
<Reset of accumulation time>
Step into F06. Input '409' and press SET key to reset non-volatile memory to '00.0' with BATTERY lamp goes off.
- Fan motor lifespan check: F32: Notice of fan motor accumulation time
(Ex. 5years and 8monts accumulated → Displayed as '05.6')
Battery lamp is blinking when about 6years has passed.
<Reset of accumulation time>
Step into F06. Input '419' and press SET key to reset non-volatile memory to '00.0'. The display reverts to chamber temperature only.
- ROM version : F30: ROM version is displayed (Ex. Ver. 1.00 → displayed as "1.00")

7. Function modes

F00	Automatically revert to chamber temperature display
F01	High temp. alarm setting
F02	Low temp. alarm setting
F03	Battery lifespan check
F04	Automatically revert to chamber temperature display
F05	Compressor delay time setting
F06	Service code input (code: 384)
F07 *	Temp. sensor Zero Adjustment
F08 *	Automatically revert to chamber temperature display
F09 *	Factory test mode Unavailable
F10 *	Factory test mode Unavailable
F11 *	Factory test mode Unavailable
F12 *	Display of temperature in temp. sensor
F13 *	Automatically revert to chamber temperature display
F14 *	Display of temperature in Comp. sensor
F15 *	Automatically revert to chamber temperature display
F16 *	Automatically revert to chamber temperature display
F17 *	Model code setting (Initialization of non-volatile ROM and memory)
F18 *	Automatically revert to chamber temperature display
F19 *	Automatically revert to chamber temperature display
F20 *	Automatically revert to chamber temperature display
F21	Communication ID setting
F22	Communication mode setting
F23 *	Automatically revert to chamber temperature display
F24	Linkage between Remote alarm terminal and buzzer
F25	Ring back time setting
F26 *	Display of actual operation rate
F27 *	Automatically revert to chamber temperature display
F28	Factory test mode Unavailable
F29	Factory test mode Unavailable
F30 *	Display of ROM version
F31 *	Automatically revert to chamber temperature display
F32 *	Fan motor lifespan check
F33~F49	Automatically revert to chamber temperature display
F50 *	Temp. alarm delay time setting

Setting procedure: In chamber temperature display, press  key over 5seconds to display "F00".
Input the desired function code with  key and  key.
Press SET key to be function mode available.
* ... You should input service code (384) in F06 beforehand.
To cancel service code, input "000" in F06 or turn the power off.

F01:	<Function>	High temp. alarm setting
	<Operation>	Input F01 and press SET key to display "010" (initial value). Set the value in the range "005"~"020" with  key. Press SET key to store the value and revert to chamber temperature display.
F02:	<Function>	Low temp. alarm setting
	<Operation>	Input F02 and press SET key to display "-10" (initial value). Set the value in the range "-05"~"-20" with  key. Press SET key to store the value and revert to chamber temperature display.
F03:	<Function>	Battery lifespan check
	<Operation>	Input F03 and press SET key to display alternately F03 with "00.0" (in case battery used for 36 days or less). Press SET key to revert to chamber temperature display.
	<Reset>	Step into F06. Input '409' and press SET key to reset non-volatile memory to '00.0' with BATTERY lamp goes off.

- F05: <Function> Compressor is turned on with forcibly delayed (by minute increment) when the power retrieves from the power failure.
 <Operation> Input "F05" and press SET key to display "003" (initial).
 Change the value in the range "003"~"015" with  key and  key.
 Press SET key to store the value and revert to chamber temperature display.
- F06: <Function> Service code input and initialization of accumulation time
 <Operation> Input F06 and press SET key to display "000" (initial value).
 Set to "384" with  key and  key. Press SET key to store the value and revert to chamber temperature display.
 <Cancel> Input F06 and press SET key to display "384".
 Change to "000" with  key and  key. Press SET key to store the value and revert to chamber temperature display.
 Service code is cancelled when the power is ON and OFF, or accumulation time is reset.
- F07: <Function> To match temperature of temp. sensor with temperature of center at the chamber.
 <Operation> ~~Input service code in F06 prior to use this mode.~~
 Input F07 and press SET key to display "00.0" (initial value).
 Change to the desired value with  key and  key in the range of "-4.9"~"04.9". Press SET key to store the value and revert to chamber temperature display.
- F12: <Function> To display the temperature of temp. sensor
 <Operation> ~~Input service code in F06 prior to use this mode.~~
 Input F12 and press SET key to display alternately F12 and "XX.X" (chamber temperature). Press SET key to revert to chamber temperature display. 3 digits indication. Minus "-" is not displayed.
 Ex) "-79.5°C" → indicated as "79.5"
- F14: <Function> To display the temperature in comp. sensor
 <Operation> ~~Input service code in F06 prior to use this mode.~~
 Input F14 and press SET key to display alternately F14 and "XX.X" (present temperature in comp. sensor). Press SET key to revert to chamber temperature display.
- F17: <Function> Non-volatile memory initialization, model code change
 <Operation> ~~Service code should be input in F06 prior to use this mode.~~
 Input F17 and press SET key to display "001". Change the value with  key and  key. Press SET key to store and revert to chamber temperature display.
 Model code '003': MDF-C8V1

<Initial values in non-volatile memory>

Zero adjustment for temp. sensor	: 0°C
Compressor forcibly OFF	: 8 min.
Ring back time	: 30 min.
Setting temperature	: -80°C
High temp. alarm setting temp.	: +10°C
Low temp. alarm setting temp.	: -10°C
Linkage between remote alarm and buzzer	: OFF
Compressor delay time	: 3 min.
Communication ID	: 000
Communication mode	: 000
Temp. alarm delay time	: 15 min.
Key lock	: OFF

- F21: <Function> Serial communication ID setting
 <Operation> Input F21 and press SET key to display "000" (initial).
 Change the value in the range "001"~"255" with  key and  key.
- F22: <Function> Serial communication mode setting
 <Operation> input F22 and press SET key to display "000" (initial value)
 Change the value with  key and  key.
 Press SET key to store the value and revert to chamber temperature display.
 Control mode (the 3rd digit)
 0: Local (initial)
 1: Remote
 Baud rate (the 2nd digit)
 0: 2400bps (initial)
 1: 4800bps
 2: 9600bps
 Note) You cannot be changed SV if control mode is set in "Remote".
- F24: <Function> Linkage between remote alarm and buzzer
 <Operation> Input F24 and Press SET key to display "000" (initial).
 Change to the desired value with  key and  key.
 Press SET key to store the value and revert to chamber temperature display.
 000: Remote alarm is outputted simultaneously with buzzer
 001: Remote alarm is not outputted simultaneously with buzzer
- F25: <Function> Ring back time setting
 <Operation> Input F25 and press SET key to display "030" (initial).
 Change to the desired value with  key and  key.
 Press SET key to store the value and revert to chamber temperature display.
- | | |
|--|-----------------------------------|
| 000: Auto recovery OFF | 040: Recovers after 40min. passed |
| 010: Recovers after 10min. passed | 050: Recovers after 50min. passed |
| 020: Recovers after 20min. passed | 060: Recovers after 60min. passed |
| 030: Recovers after 30min. passed
(initial) | |
- F26: <Function> Actual running rate is displayed (unit: %)
 <Operation> ~~Service code should be input in F06 prior to use this mode.~~
 Input F26 and press SET key to display alternately F26 with "XXX"
 (present actual running rate).
 Press SET key to revert to chamber temperature display.

F30:	<Function>	ROM version is displayed
	<Operation>	Service code should be input in F06 prior to use this mode. Input F30 and press SET key to display alternately F30 with "X.XX" (present ROM version). Press SET key to revert to chamber temperature display.
F32:	<Function>	Fan motor lifespan check
	<Operation>	Service code should be input in F06 prior to use this mode. Input F32 and press SET key to display '00.0' (accumulation time is 36days or less). Set your desired setting with  key and  key pressed. Press SET key to store the value and revert to chamber temperature display.
	<Reset>	Step into F06. Input '419' and press SET key to reset non-volatile memory to '00.0'. The display reverts to chamber temperature only.
F50	<Function>	Temp. alarm delay time setting
	<Operation>	Service code should be input in F06 prior to use this mode. Input F50 and press SET key to display '015' (initial). Set your desired value with  key and  key pressed. (Range:000~015) Press SET key again to store the value and revert to chamber temperature display.
		'000' = Not delayed

8. Control of compressor

- (1) Compressor turns ON when chamber temperature is equal to setting temperature + 0.4°C.
- (2) Compressor turns OFF when chamber temperature is equal to setting temperature – 0.4°C.

9. Compressor protection

When fan motor is locked, compressor stops running to prevent compressor temperature from going higher if the temperature in comp. sensor is equal or higher than 65°C.

Compressor restarts running when the temperature in comp. sensor is equal or lower than 50°C.

10. Delay time

Compressor delay time:	(Initial: 3 min.) Compressor starts running with delay after the power is supplied. You can set delay time in F05. When compressor stops running during cycle, compressor is forcibly stop running the next 3 min.
Temp. alarm delay time:	(Initial: 10min.) In high/low temp. alarm condition, buzzer and remote alarm are emitted with delay time. You can set delay time in F50. ALARM lamp and display blink without delay.
Power failure alarm delay time:	(3 sec. fixed) Power failure alarm is emitted with 3 sec. of delay after the power has failed.

11. Prevention for oil logging in capillary tube

Compressor is forcibly stop operation to prevent oil from being logged in capillary tube.

Interval : Once every 12 hrs.

Period : 8 min.

Timing : 1) About 9 sec. of delay after compressor stops operation during cycle after 12 hrs has passed since the unit had started operation.
2) Compressor is forcibly stop operation when compressor keeps running for 60 min. even if it should be stopped.

12. Temp. sensor offset

Temp. sensor offset is done to correct the gap between the temperature in temp. sensor and the actual temperature.

Temp. sensor offset: +4.0°C

13. Remote alarm terminal

Condition	No-voltage output from CN3	
	1 – 2 (N.O.)	1 – 3 (N.C.)
Normal	Open	Close
In alarm	Close	Open

14. Settings after power retrieves (Power-on reset)

Alarms : OFF
Compressor : OFF
Remote alarm : OFF
Ring-back time : 30 min.
Timers : Reset
2H, 8H timer : 0 (Reset)
Warming-up operation : ON
Counting the time of compressor stops : Reset
Setting data : Read by non-volatile memory

15. Other specifications

(1) Lamp specifications:

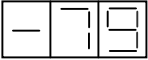
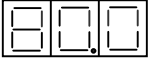
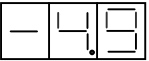
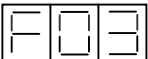
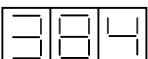
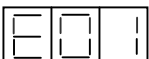
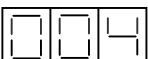
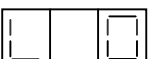
<Control PCB>

DP1: Orange lamp
Goes off: High/low temp. alarm, sensor error, power failure
Lit : Normal condition
DP2: Green lamp
Goes off: Compressor OFF (normal condition)
Lit : Compressor ON

<Display PCB>

DP51: Red lamp
Blinks : Alarm condition
DP52: Orange lamp
Lit : Battery lifespan is expired. (About 3 yrs)
Blinks : Notice of fan motor lifespan is expired (About 6 yrs)

(2) Examples of display

Chamber temp.	-79.5°C		Decimal point of chamber temp.	-80.0	
Set temp.	-80.0°C		Sensor offset	-4.9	
Function	F03		Operation monitoring	Con	
Service code	384		Error	E01	
Set value	004		Accumulation time	8H timer 135	
Key Lock	L_0				

(3) Buzzer specifications:

Key operation:

A click emitted if available

Unacceptable input:

Alarming tone emitted for 1 second

Parts layout



<Temp. sensor PT-1000>



<Control panel>



<Opposite side of control panel>



Main PCB

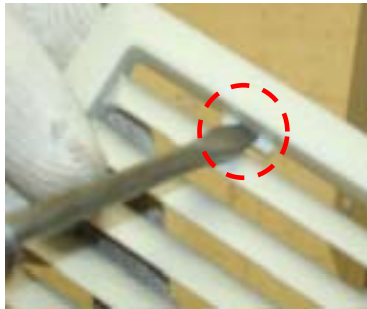
Switching power supply

Control PCB

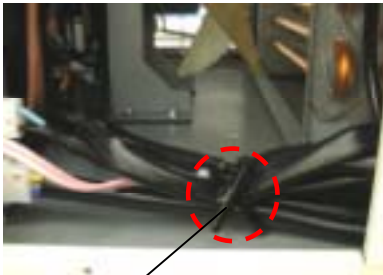
Display PCB

<How to access the Main PCB>

1. Catch the pick by screwdriver and pull the panel out.



2. Loosen tie band to set cables free. Pull Electric BOX out carefully.



Tie band



<Lower back side>



Compressor

<Remote alarm>



Battery switch

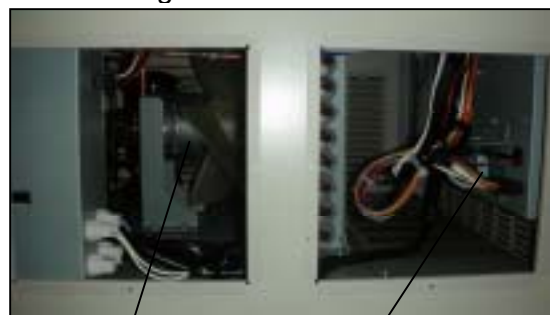
<Lower left side>



Electric Box

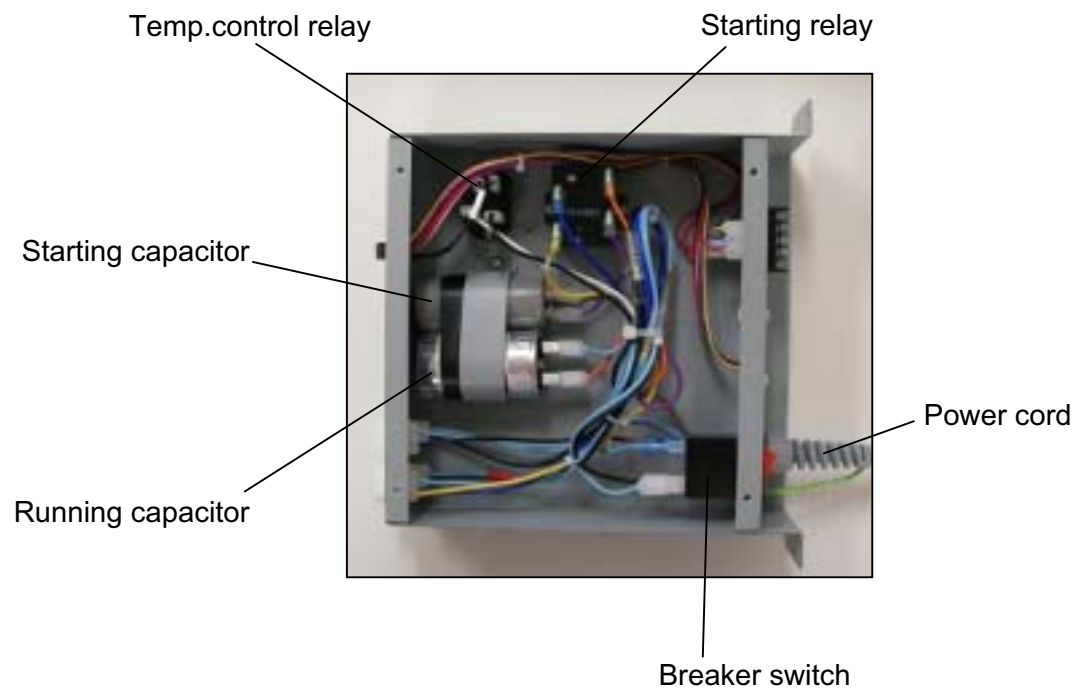
Expansion tank

<Lower right side>



Condensing fan motor

Battery



Temp.control relay

Starting relay

Starting capacitor

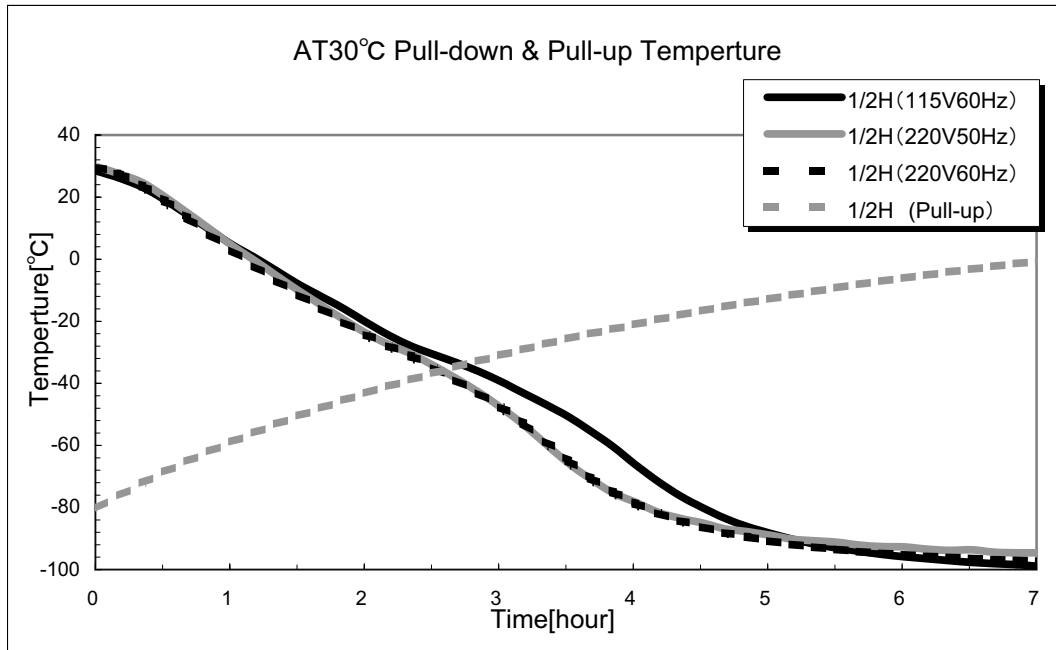
Running capacitor

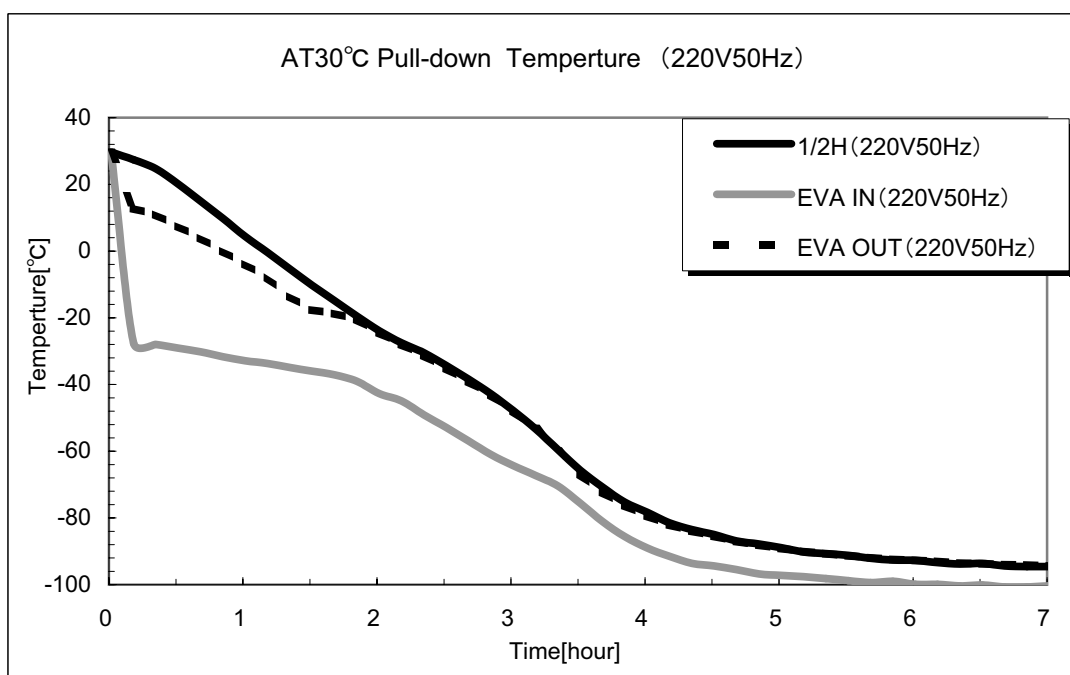
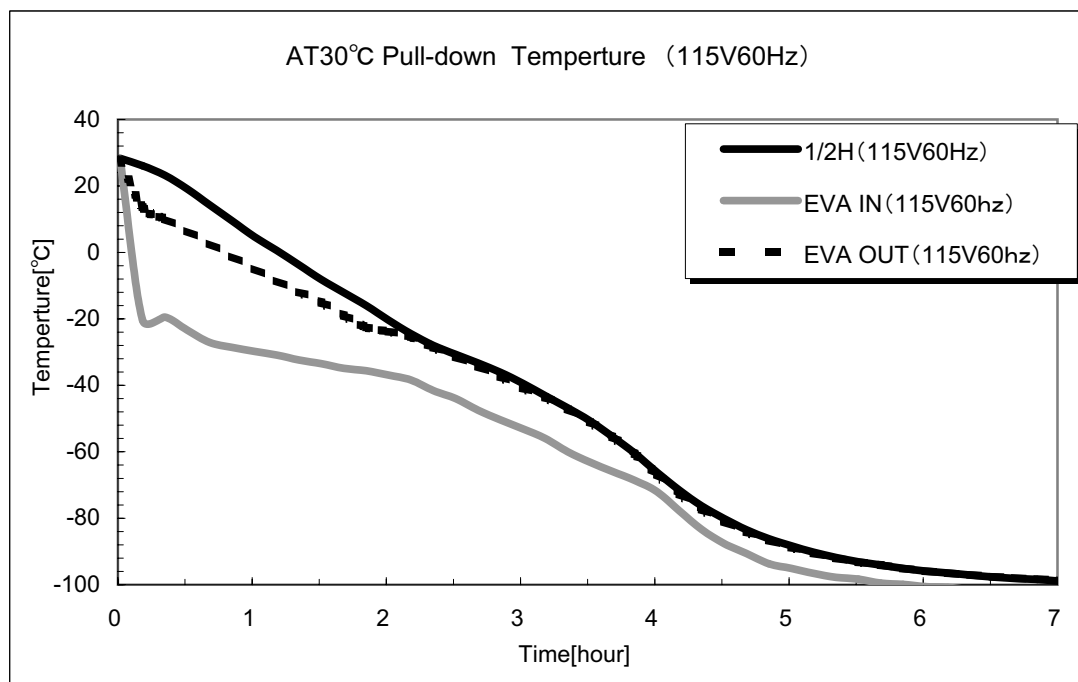
Power cord

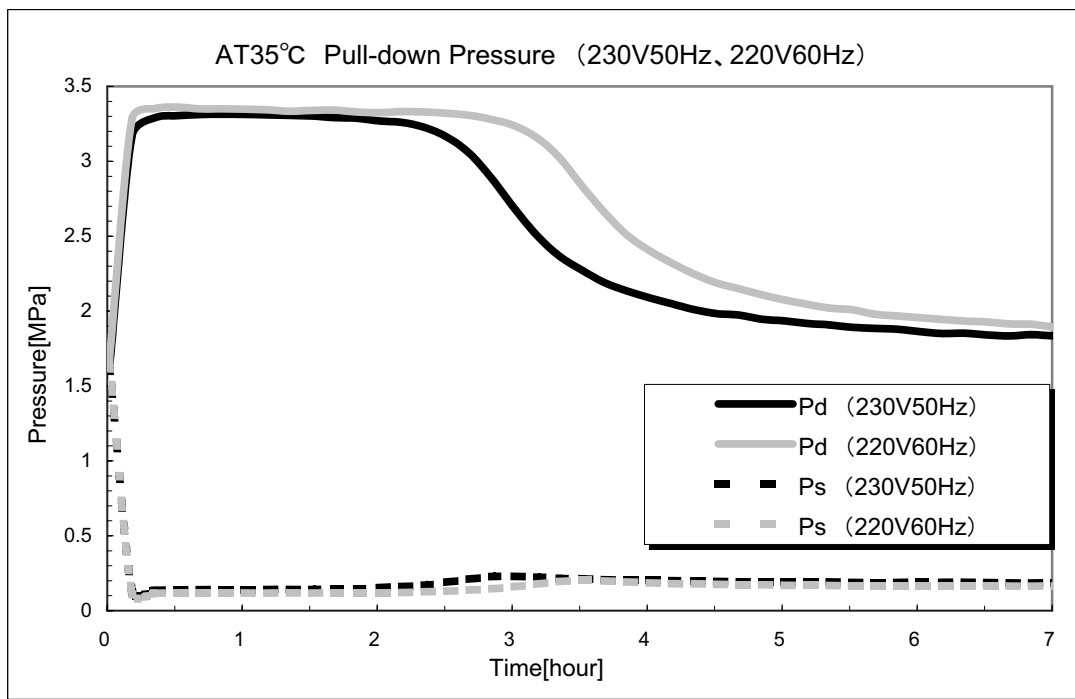
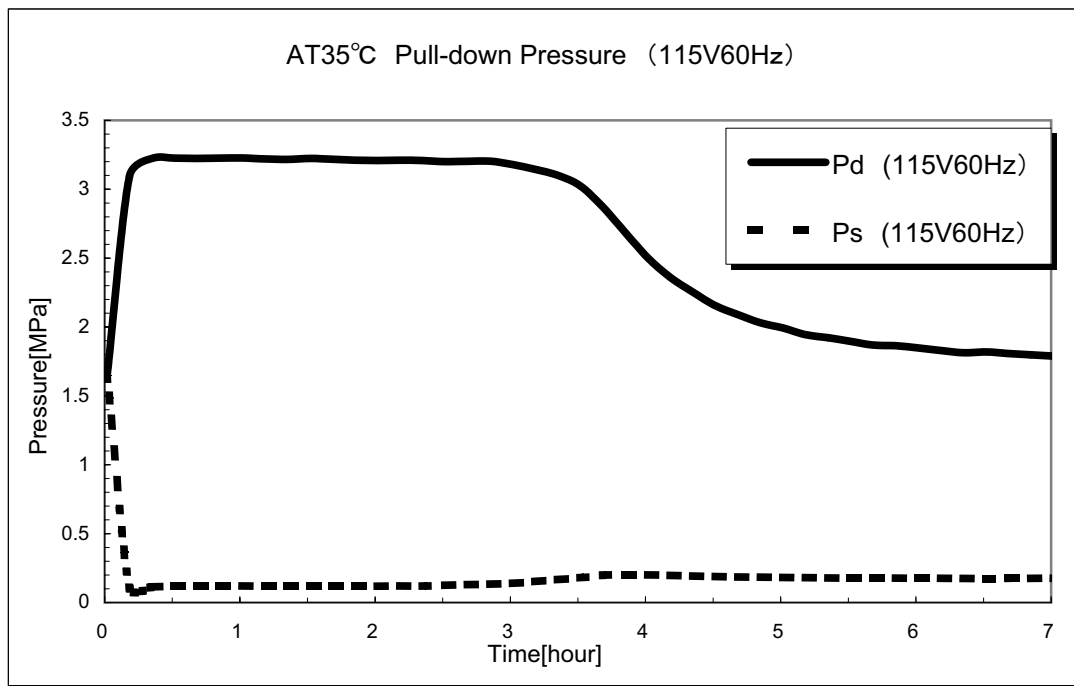
Breaker switch

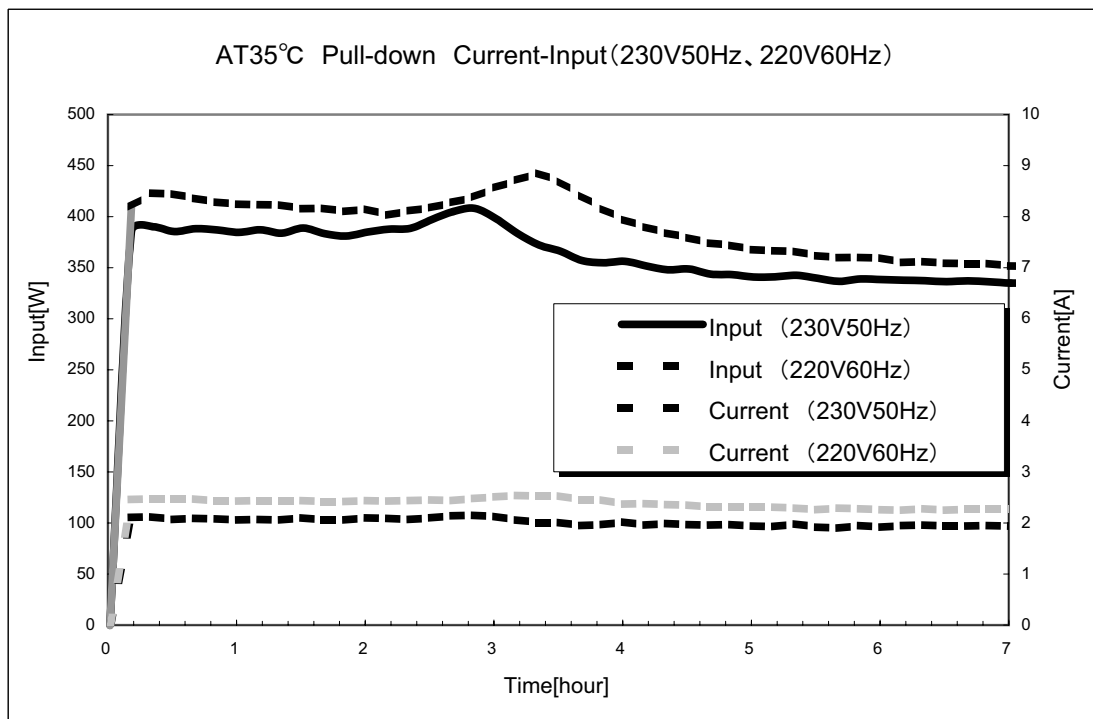
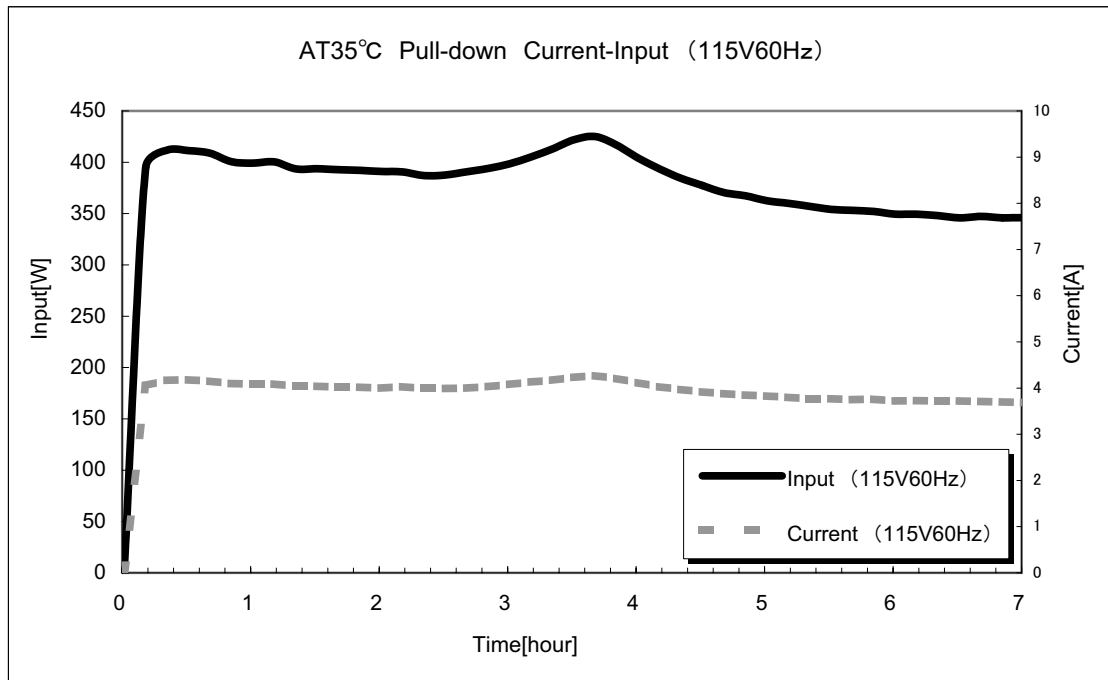
Test data

Note) These data are the reference only.

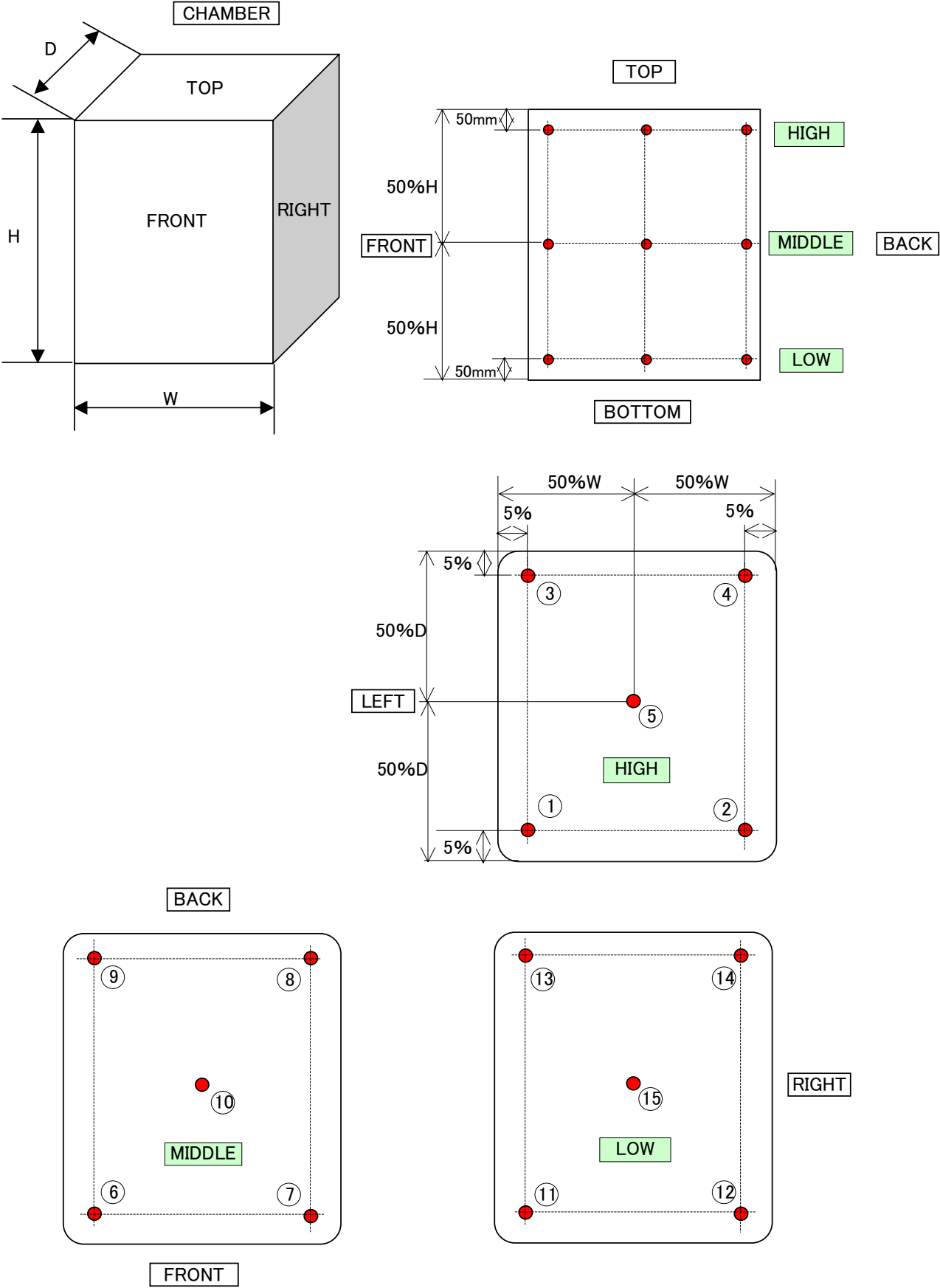








MDF-C8V1 Temperature Uniformity - 15points measured (Reference Data)



<Conditions>

Ambient temperature: 20/30°C Note: This data does not represent a guarantee of product performance.

Load: Unloaded

<Distribution data>

Temperature of the cycle in each area (SV=-80°C, air temperature)

Unit: °C

	Ambient temperature 20°C							
	50Hz				60Hz			
	Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	-78.8	-84.7	-82.0	±3.0	-78.8	-84.7	-82.0	±3.0
②	-79.5	-84.8	-82.2	±2.7	-79.5	-84.8	-82.2	±2.7
③	-78.0	-84.9	-81.5	±3.5	-78.0	-84.9	-81.5	±3.5
④	-79.7	-84.5	-82.1	±2.4	-79.7	-84.5	-82.1	±2.4
⑤	-78.1	-81.4	-79.8	±1.7	-78.1	-81.4	-79.8	±1.7
⑥	-80.4	-83.4	-81.9	±1.5	-80.4	-83.4	-81.9	±1.5
⑦	-80.4	-83.3	-81.9	±1.5	-80.4	-83.3	-81.9	±1.5
⑧	-80.1	-83.2	-81.7	±1.6	-80.1	-83.2	-81.7	±1.6
⑨	-79.8	-82.9	-81.4	±1.6	-79.8	-82.9	-81.4	±1.6
⑩	-78.8	-81.3	-80.1	±1.3	-78.8	-81.3	-80.1	±1.3
⑪	-79.8	-82.8	-81.3	±1.5	-79.8	-82.8	-81.3	±1.5
⑫	-79.6	-82.5	-81.1	±1.5	-79.6	-82.5	-81.1	±1.5
⑬	-78.8	-81.1	-80.0	±1.2	-78.8	-81.1	-80.0	±1.2
⑭	-79.4	-82.0	-80.7	±1.3	-79.4	-82.0	-80.7	±1.3
⑮	-78.8	-81.1	-80.0	±1.2	-78.8	-81.1	-80.0	±1.2
Average	-	-	-81.1	-	-	-	-81.1	-

Unit: °C

	Ambient temperature 30°C							
	50Hz				60Hz			
	Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	-78.5	-84.4	-82.1	±3.0	-79.2	-84.9	-82.4	±2.9
②	-79.1	-84.5	-81.8	±2.7	-79.8	-85.0	-82.4	±2.6
③	-78.1	-84.6	-81.4	±3.3	-78.6	-85.1	-81.9	±3.3
④	-79.3	-84.4	-81.9	±2.6	-80.0	-84.7	-82.4	±2.4
⑤	-77.7	-81.3	-79.5	±1.8	-78.4	-81.6	-80.0	±1.6
⑥	-79.7	-83.4	-81.6	±1.9	-80.5	-83.7	-82.1	±1.6
⑦	-79.7	-83.3	-81.5	±1.8	-80.6	-83.6	-82.1	±1.5
⑧	-79.5	-83.2	-81.4	±1.9	-80.3	-83.5	-81.9	±1.6
⑨	-79.3	-82.9	-81.1	±1.8	-80.1	-83.2	-81.7	±1.6
⑩	-78.3	-81.2	-79.8	±1.5	-79.0	-81.5	-80.3	±1.3
⑪	-79.3	-82.7	-81.0	±1.7	-80.2	-83.1	-81.7	±1.5
⑫	-79.2	-82.5	-80.9	±1.7	-80.0	-82.9	-81.5	±1.5
⑬	-78.1	-81.1	-79.6	±1.5	-78.9	-81.4	-80.2	±1.3
⑭	-79.0	-81.9	-80.5	±1.5	-79.7	-82.3	-81.0	±1.3
⑮	-78.2	-80.9	-79.6	±1.4	-78.9	-81.3	-80.1	±1.2
Average	-	-	-80.9	-	-	-	-81.4	-

<Amount of power consumption>

Amount of power consumption when driving at cycle
(SV=-80°C)

Unit: kWh/day

	Ambient temperature 20°C		Ambient temperature 30°C	
	50Hz	60Hz	50Hz	60Hz
115V	-	4.07	-	4.89
220V	-	4.27	-	5.11
230V	4.21	-	5.04	-

Note: This data does not represent a guarantee of product performance.

<Conditions>

Ambient temperature: 20/30°C Note: This data does not represent a guarantee of product performance.
Load: Unloaded

<Distribution data>

Temperature of the cycle in each area (SV=-70°C, air temperature)

Unit: °C

	Ambient temperature 20°C							
	50Hz				60Hz			
	Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	-67.6	-75.4	-71.6	±3.9	-67.2	-75.6	-71.4	±4.2
②	-68.8	-75.5	-72.2	±3.4	-68.4	-75.8	-72.1	±3.7
③	-66.6	-75.5	-71.1	±4.5	-66.0	-75.7	-70.9	±4.9
④	-69.0	-75.3	-72.2	±3.2	-68.7	-75.6	-72.2	±3.5
⑤	-67.6	-72.1	-69.9	±2.3	-67.3	-72.4	-69.9	±2.6
⑥	-70.6	-74.1	-72.4	±1.8	-70.6	-74.3	-72.5	±1.9
⑦	-70.7	-74.0	-72.4	±1.7	-70.7	-74.2	-72.5	±1.8
⑧	-70.4	-73.9	-72.2	±1.8	-70.4	-74.1	-72.3	±1.8
⑨	-70.2	-73.6	-71.9	±1.7	-70.3	-73.8	-72.1	±1.8
⑩	-69.1	-72.1	-70.6	±1.5	-69.2	-72.3	-70.8	±1.6
⑪	-70.3	-73.4	-71.9	±1.6	-70.4	-73.6	-72.0	±1.6
⑫	-70.1	-73.2	-71.7	±1.6	-70.2	-73.3	-71.8	±1.6
⑬	-69.2	-71.9	-70.6	±1.4	-69.3	-72.1	-70.7	±1.4
⑭	-69.8	-72.6	-71.2	±1.4	-69.9	-72.9	-71.4	±1.5
⑮	-69.2	-71.9	-70.6	±1.4	-69.3	-72.0	-70.7	±1.4
Average	-	-	-71.5	-	-	-	-71.5	-

Unit: °C

	Ambient temperature 30°C							
	50Hz				60Hz			
	Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	-68.5	-75.6	-72.2	±3.6	-68.2	-76.0	-72.3	±3.9
②	-69.4	-75.8	-72.6	±3.2	-69.2	-76.2	-72.7	±3.5
③	-67.7	-75.8	-71.8	±4.1	-67.1	-76.2	-71.7	±4.6
④	-69.6	-75.6	-72.6	±3.0	-69.4	-75.9	-72.7	±3.3
⑤	-68.0	-72.4	-70.2	±2.2	-68.1	-72.8	-70.5	±2.4
⑥	-70.6	-74.5	-72.6	±2.0	-70.9	-74.9	-72.9	±2.0
⑦	-70.7	-74.4	-72.6	±1.9	-71.0	-74.8	-72.9	±1.9
⑧	-70.3	-74.3	-72.3	±2.0	-70.6	-74.7	-72.7	±2.1
⑨	-70.2	-74.0	-72.1	±1.9	-70.6	-74.4	-72.5	±1.9
⑩	-69.1	-72.4	-70.8	±1.7	-69.5	-72.7	-71.1	±1.6
⑪	-70.3	-73.9	-72.1	±1.8	-70.7	-74.3	-72.5	±1.8
⑫	-70.1	-73.6	-71.9	±1.8	-70.6	-73.9	-72.3	±1.7
⑬	-69.1	-72.4	-70.8	±1.7	-69.5	-72.6	-71.1	±1.6
⑭	-69.8	-73.1	-71.5	±1.7	-70.2	-73.4	-71.8	±1.6
⑮	-70.6	-72.1	-69.1	±0.8	-69.5	-72.6	-71.1	±1.6
Average	-	-	-71.7	-	-	-	-72.0	-

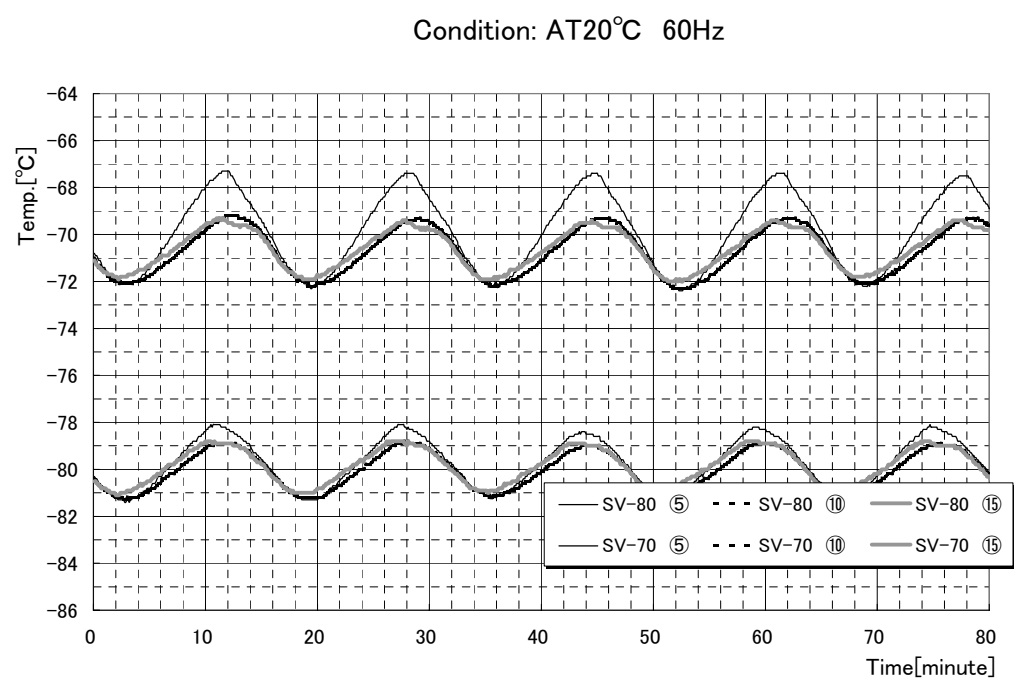
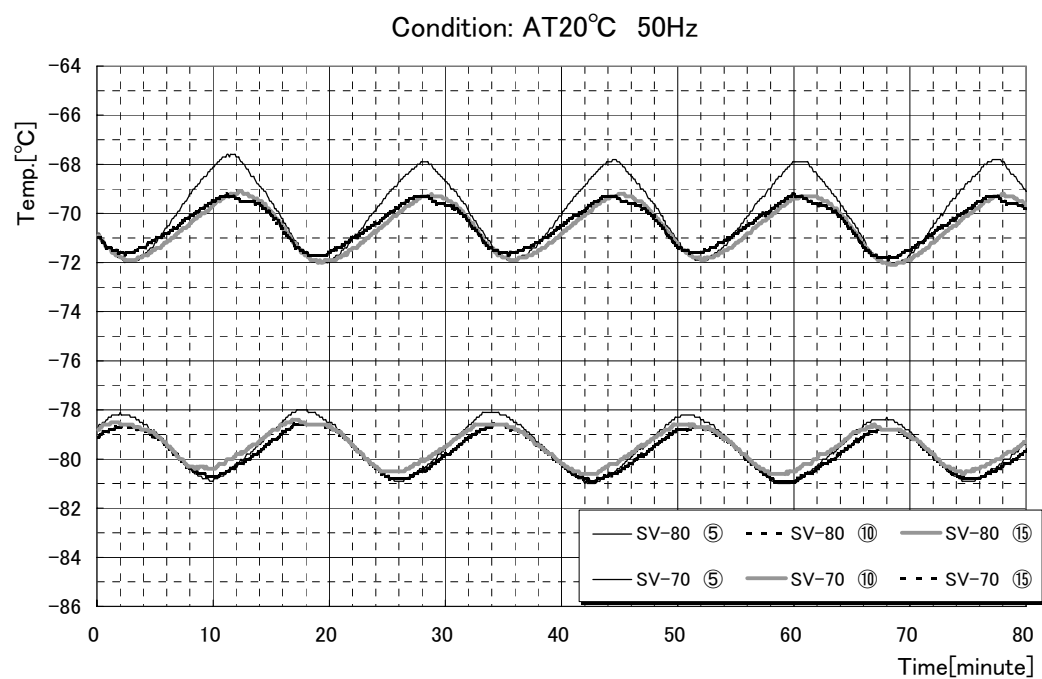
<Amount of power consumption>

Amount of power consumption when driving at cycle
(SV=-70°C)

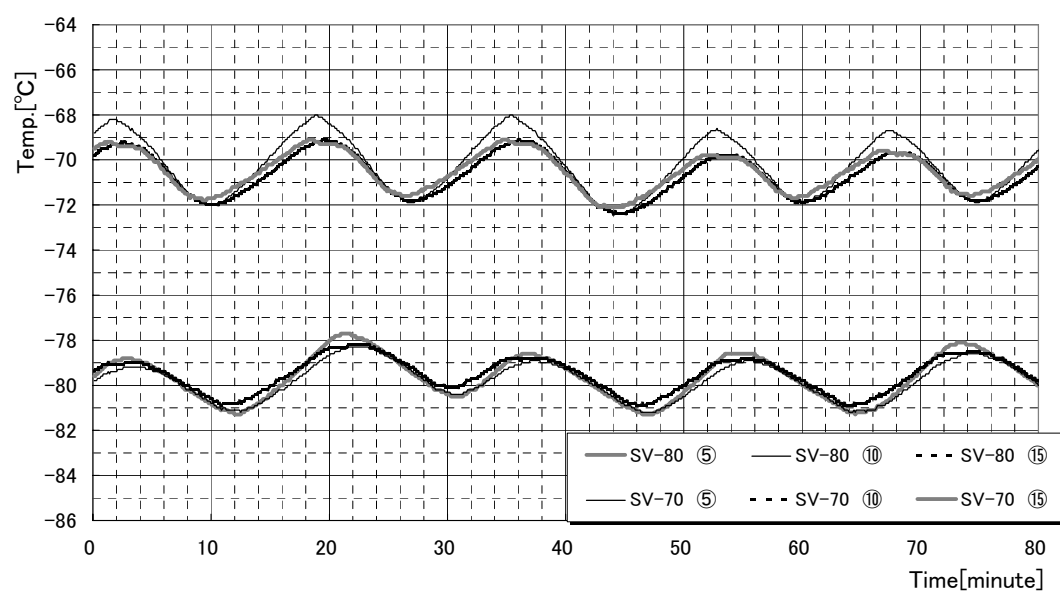
Unit: kWh/day

	Ambient temperature 20°C		Ambient temperature 30°C	
	50Hz	60Hz	50Hz	60Hz
115V	-	4.06	-	4.26
220V	-	3.82	-	4.30
230V	3.89	-	4.17	-

Note: This data does not represent a guarantee of product performance.



Condition: AT30°C 50Hz



Condition: AT30°C 60Hz

